

The European Debt Crisis: A Mathematical Analysis

An Honors Thesis (HONRS 499)

by

Grace Perdew and Angela Zeiger

Thesis Advisor

Curtis Gary Dean

A handwritten signature in black ink that reads "Curtis Gary Dean". The signature is written in a cursive style with a large, stylized 'C' and 'D'.

Ball State University

Muncie, Indiana

May 2012

Expected Date of Graduation

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Abstract

The creation of the single currency is the great experiment of the European Union. In the years immediately following 2002, the benefits of having the single currency seemed to far outweigh the negatives, and eventually the euro zone grew to 17 countries and principalities. When the euro was first created, all of Europe suddenly enjoyed low interest rates and increased credibility. As a result of this new economic climate, some southern European countries were able to borrow more than they should have been able to, resulting in what has been coined the European debt crisis. The tipping point in this crisis is somewhere in 2008, but what exactly set things in motion? This paper takes a look at key countries and potential causes of this continent-wide crisis.

Acknowledgements

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Introduction

Since the end of World War II, the European Union has been an ever-growing alliance among European nations. Starting as a close economic and political relationship among France, Germany, Belgium, Italy, and the Netherlands, eventually more and more countries joined the emerging EU, until it became the 27 country organization we know it to be today ("The History of the European Union").

In December 1991, the Economic and Monetary Union (EMU) was formed by the Treaty on European Union. This set the basis for establishing a single currency and they began to set main policy orientations (Europa). The EMU took the countries one step further in achieving economic integration by reducing or eliminating tariffs between countries as well as strengthening central bank communication (European Central Bank). By 1999, eleven countries were members of the Economic and Monetary Union and switched their currency to the euro, at this point an electronic currency. These countries were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain ("EUR-Euro"). Circulation of the actual currency took place 3 years later, in 2002 ("What Is the Euro"). The creation of the single currency is the great experiment of the European Union. In the years immediately following 2002, the benefits of having the single currency seemed to far outweigh the negatives, and eventually the euro zone grew to 17 countries (Eurostat).

When the euro was first created, all of Europe suddenly enjoyed low interest rates and increased credibility. "As recently as 2008, the market was lending to Greece and Germany at pretty much the exact same price. The assumption was that the euro could never break up, and thus everyone in it was as safe a bet as the safest, biggest economy

on the euro: Germany” (Klein and Kliff). As a result of this new economic climate, some southern European countries were able to borrow more than they would have been able to if not on the euro, resulting in what has been coined the European debt crisis. It can be clearly seen in this OECD graph of sovereign bond yields that the tipping point in this crisis is somewhere in 2008, but what exactly set things in motion? The housing crisis? An aging generation of baby-boomers? Prolonged trade deficits? Or even just simple mismanagement of government money?

Figure 1.4. Investors are now discriminating strongly across euro area sovereign bonds
10-year sovereign bond yield, in per cent

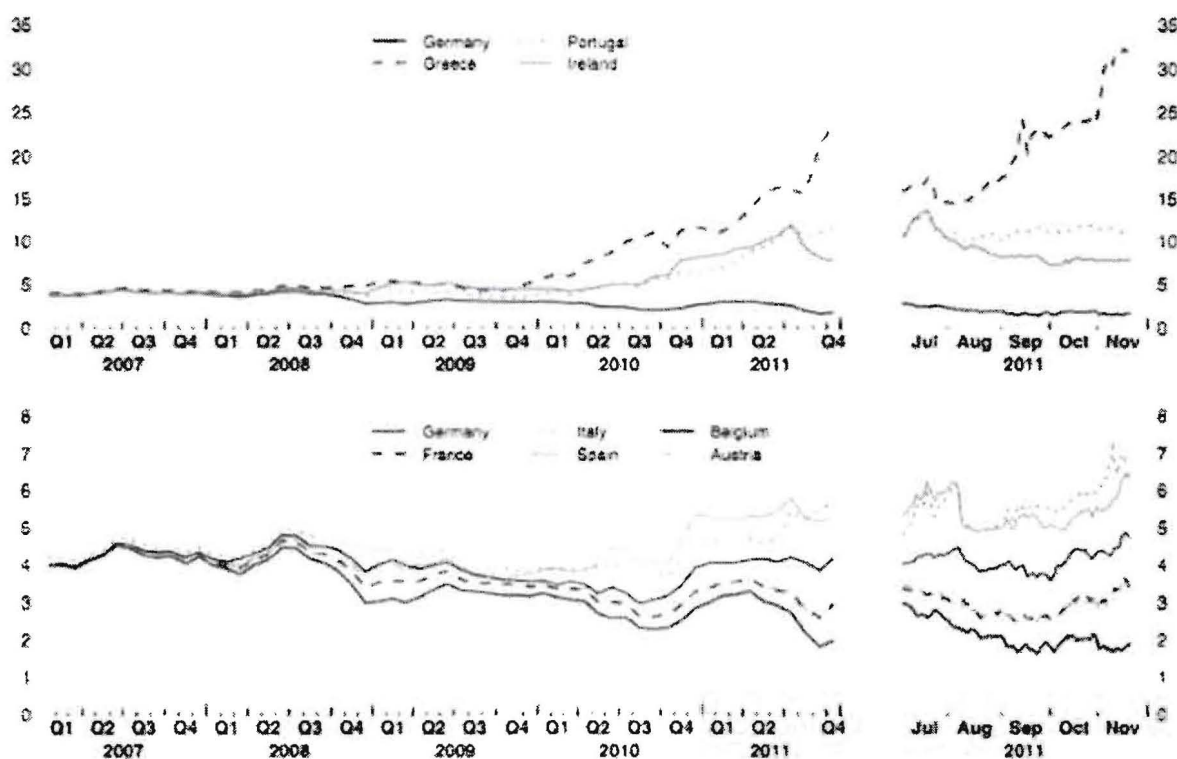


Figure 1: 10-year Sovereign Bond Yield
Source: OECD Economic Outlook

Chapter 1: An analysis in key countries

Greece

The country receiving the most attention in the debt crisis is undoubtedly Greece. Greece joined the euro on January 1, 2001 after fulfilling the requirements that include:

- Having a budget deficit of less than 3% of GDP
- A government debt of less than 60% or a declining trend,
- Inflation must be within 1.5% of the three European Union countries with the lowest inflation
- Domestic bond spread must be less than 2% over German bonds,
- They must be a member of the European Exchange Rate Mechanism II (ERM2) for two years without causing severe tension (“The Rules for Joining the Euro”).

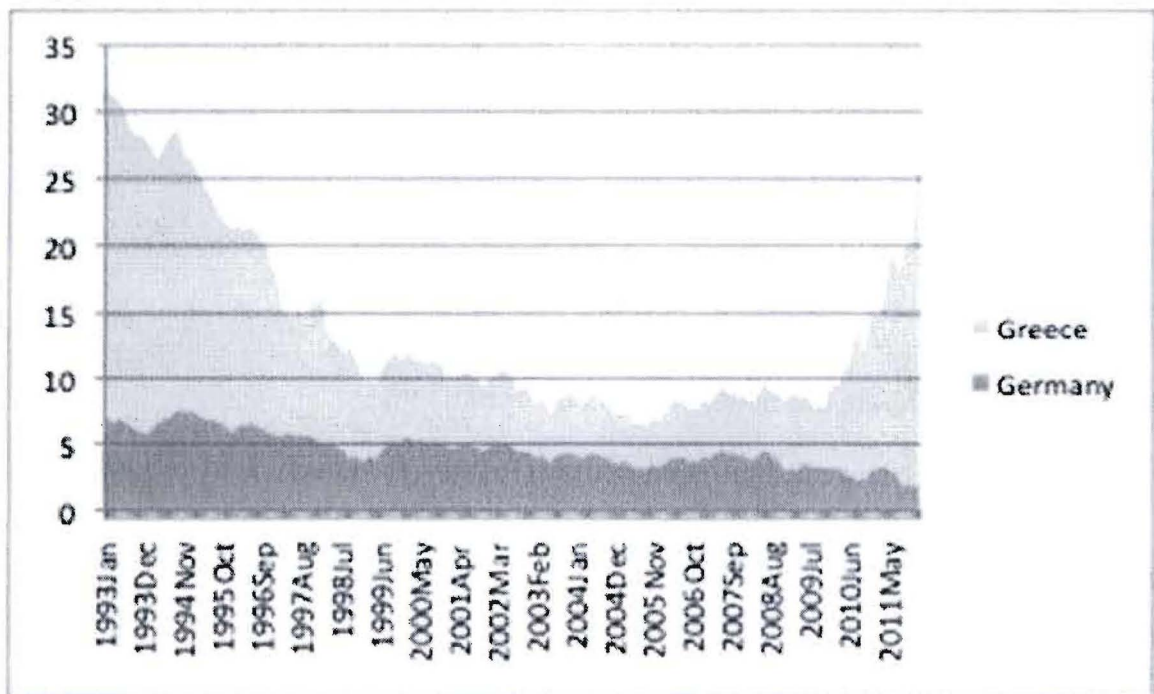


Figure 2: Government Bond Yields
Source: European Central Bank

Instead of working to improve their economy once they joined the euro, Greece began to sell their debt at lower interest rates since the euro was attractive to foreign investors. Before switching to the euro, Greece showed little interest in international bonds (SPIEGEL Staff). Since they were a smaller country with an underdeveloped economy, there were few foreign investors that were interested in buying Greek bonds. However, after the switch to the euro, they were part of the European Union and essentially began borrowing on Germany's credibility and credit rating. In the spring of 2003, Greek bond yields were only .09% above the equivalent German bonds. By attracting foreign investors with the euro, Greece was able to sell off large volumes of debt instead of being forced to reform their finances.

In November of 2004, Greece's new conservative government admitted to effectively lying about its budget deficit. Greece had in fact not had a budget deficit of less than 3% since before 1999 ("Timeline of a Crisis"). The second shocking revelation came about in 2009, when a post-election government came out with a revised budget deficit number. Instead of 6%, it was actually approximately 13%, and investors took notice (Blumberg). Suddenly the implicit German credibility given to Greece by using the euro vanished. Investors sold their Greek debt, kick starting Greece's solvency problems, and therefore the entire European debt crisis.

After Greece revealed differing statistics in 2009, the government decided to overhaul the National Statistical Service of Greece, the office responsible for key government figures like GDP growth and the budget deficit (Papapostolou). Before the overhaul, the statistics office was part of the Finance Ministry, and this led politicians to pressure the number crunchers in the statistics office into producing better looking

numbers. As a result, the accuracy of the numbers presented was often questioned since the Finance Ministry operated so closely with the statistical office. Under the new system, the statistical office was separated to reduce pressure from other parties. The new system was named the Hellenic Statistical Authority and its goal was to improve the quality of statistics it released. There has still been some conflict on whether or not the Hellenic Statistical Authority board should be allowed to vote on the numbers before they are released (Dabilis). This has caused tension between the Hellenic Statistical Authority and the Finance Ministry with the Ministry questioning the numbers produced. However, the European Union's central statistical service, Eurostat, believes the office is now accurate.

Greece did not have a problem securing low-interest loans after it joined the euro, yet the government still accumulated massive debt. Instead of using this money to reboot their economy, they continued to consume on credit (SPIEGEL Staff). Buying German

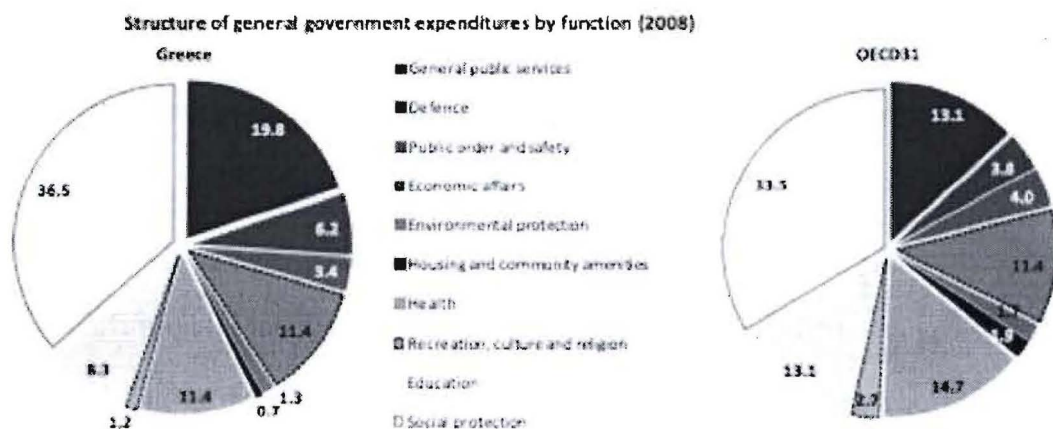


Figure 3: Structure of general government expenditure-
Greece

Source: OECD National Accounts

made machinery and cars improved Germany's economy while not helping their own. According to the Organisation for Economic Co-operation and Development (OECD), Greece spends more than the average country on general public services, defense, and social protection while spending less on housing, education and health (OECD). Their defense budget is at 6.2% of GDP while the average country is at 3.8%. For a democratic country of its size, they have an unusually high defense budget. Although Turkey is considered a potential threat by Greece, in the past Turkey has proposed a mutual reduction in arms spending and Greece has not accepted. Both Turkey and Greece are also members of North Atlantic Treaty Organization (NATO) so it seems unlikely for an attack to occur (Haydon). Greece continues to buy most of its arms from Germany and France. Perhaps their money would be put to better use in other sectors that would contribute to economic growth.

Greece has a highly centralized government so negative production costs affect the Greek government more so than in other countries. Many other countries place more emphasis on the private sector to produce goods. The central government collected 68.1% of all government revenue in 2009 and accounted for 54.3% of the expenditures. This is higher than the OECD country averages of 57.7% of revenues and 45.8% of expenditures. These numbers show that Greece has a larger central government than the average country. It also shows that Greece's central government is significantly bigger than their local government. Greece also had 40% of expenditures going to social security funds, which is almost double of the OECD average of 22.7% (OECD). Even though their social security fund expenditure is over 17% higher than average, their social security fund revenue is only at 29.2%, which is about 9% higher than average. There is

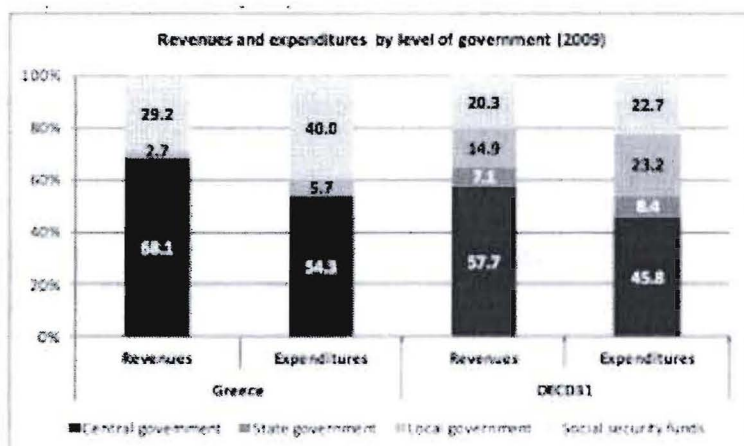


Figure 4: Revenue and expenditure for Greece
Source: OECD National Accounts

clearly an imbalance of revenue and expenditure here, suggesting a social security fund reform is needed.

Greece is comparable to the average OECD country with 23% of their economy being devoted to producing public goods and services. However, the production costs as a share of GDP increased about 4% from 2000 to 2009 while the average was an increase of about 2.5%. Instead of moving production costs to the private sector, the government increased the amount spent on compensating general government employees by about 3%

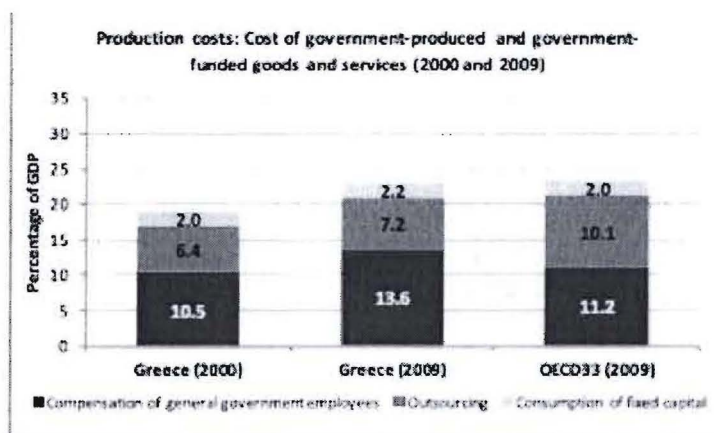


Figure 5: Production Costs in Greece
Source: OECD National Accounts

compared to an average of an increase of less than 1%. Greece now relies more heavily on government employees in the production process than most other countries.

The Greek government also spends a smaller portion on education compared to other countries. In 2011 they allocated 8.3% of government expenditure to education while the OECD average was 13.1% (OECD). Although Greece has a slightly smaller school-age population, when looking at other education statistics it seems clear that they could benefit by investing more in education. Countries with a strong educational system typically have lower unemployment rates and a growing economy (Pont). In the latest PISA (Programme for International Student Assessment) testing, Greece's students averaged lower than the OECD average. Greece also has a higher than average dropout rate; 25% of 25 to 34 year olds do not complete upper secondary education compared to a 19% average. A higher percentage of unemployed people have not completed secondary education, so it seems that if Greece spent more to improve their educational system it would improve their economy in the long run.

Greece has been operating on a negative trade balance for over the past decade, and this has contributed to the lack of growth. Instead of increasing their amount of exported goods to stimulate the economy, the country has consistently relied on importing what they need. The major imports of Greece include machinery, transport equipment, fuels, and chemicals. Major exports include food, manufactured goods, petroleum products, chemicals, and textiles ("Economy Watch"). Greece has had a negative trade balance for many years, however in the last few years it has not been quite as bad. Although it seems that Greece is trying to increase its production of goods, it can be challenging for a country to reverse a negative trade balance. Moving from

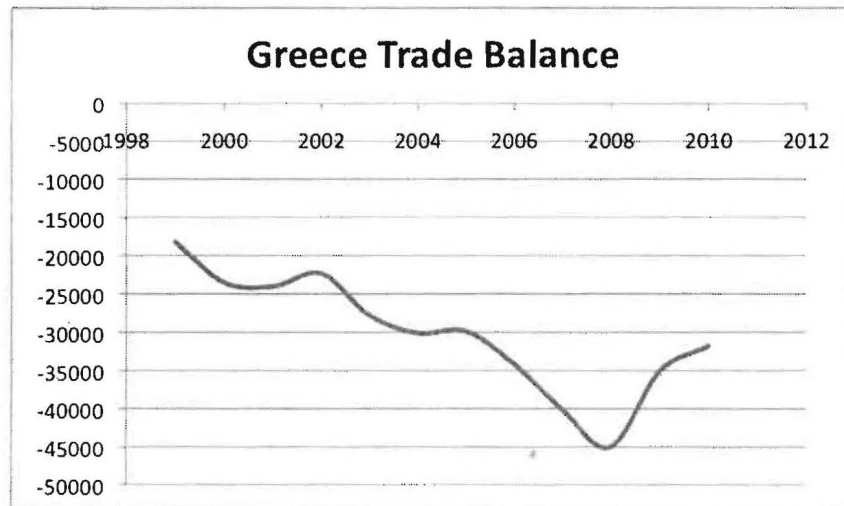


Figure 6: Trade Balance in Greece
Source: Eurostat

consumption based to export based is not an easy shift in an economy, and typically requires policy overhauls. Producing machinery, for instance, can have major downsides since technology may be more advanced in other countries. Many industries can be difficult to break into until efficient methods are learned and implemented. However, if Greece could continue moving towards a positive trade balance it would help stimulate growth in the economy in the long run.

Another major problem in Greece is tax evasion, the government needs to be able to collect taxes to increase their revenue but the tax system in Greece needs a lot of work. Some of the flaws of the current tax system include allowing people to claim how much they make, tax officials accepting bribes, over claiming expenses with fraudulent receipts and overseas tax havens. By allowing people to claim how much they make, many people, especially doctors, claim to make significantly less than they actually do. Therefore, they are paying much less in taxes; this could be improved by forcing citizens to include pay stubs with their taxes (Malone). Occasionally, these people will be caught

but in the past they simply handed over a large amount of cash to tax officials and it was overlooked.

The government is trying to correct this by offering their own incentives for reporting tax evaders. By offering incentives, they are also encouraging people to not over claim expenses. Some taxi drivers used to write in the amount and would increase it if the customer asked which allows the customer to get a bigger tax break when writing off expenses. This problem could also be fixed if the receipt printed the amount on the meter instead of allowing people to write it in. Overseas tax havens are a more recent problem with citizens moving their extra money that was unclaimed. Although it may be hard to undo this damage, it can certainly be prevented in the future by improving the tax system and not allowing citizens to report how much they make without any documentation.

Greece also has trouble collecting money from their metro system (Malone). The metro system does not have barriers or turnstiles to prevent people from boarding. Currently, there are machines to the side with instructions to pay before boarding. Few people bother to do this and instead enjoy riding on the metro for free. The metro system brings in about \$128.21 million from ticket sales but costs about \$801.34 million per year to operate. Although it would be expensive to add turnstiles in at every stop, in the long run it would definitely pay off to receive that income. The metro could be an efficient system if the right measures were in place so it was not costing the country almost \$700 million in year to operate after ticket sales.

In 2012, bailout packages were approved for Greece. These bailouts involved “haircuts” for the lenders and will reduce Greek debt from 160% of GDP to 120% of

GDP (“EU Summit”). However, the problems in Greece cannot be solved overnight and there is not one clear solution. Although these bailouts may help, they are by no means a permanent solution. By focusing on growing the economy, cutting unnecessary costs, and increasing tax revenues the debt will slowly shrink. Once the economy turns around, Greece needs to make sure they begin investing in long-term improvements like education, infrastructure, and technology. They also need to figure out how to regulate sectors without financially supporting them. Hopefully, as they are working out of this crisis they will improve their fiscal policy and economy to ensure a situation like this does not happen again.

Ireland

Ireland became the first country in the euro zone to fall into recession according to the Central Statistics Office (“Central Statistics Office Ireland”). The country officially fell into recession in September 2008, although the economy started to suffer earlier. In years prior to the recession, Ireland experienced massive economic growth especially in the housing sector. The housing sector was able to experience growth because people and business could easily secure mortgages from banks. With low interest rates, banks began lending money with very little restrictions in place. Although some more conservative banks had tactics in place to ward off high risks, some banks like the Anglo Irish Bank, lent to property developers and homeowners without assessing the risks (Stanage). When Ireland adopted the euro, they had much more exposure to global markets and could obtain wholesale funding (OECD). Wholesale funding is a method of funding banks by

borrowing short-term loans from other banks and institutions (“Wholesale Funding”).

Ireland began to rely heavily on wholesale funding, as did most

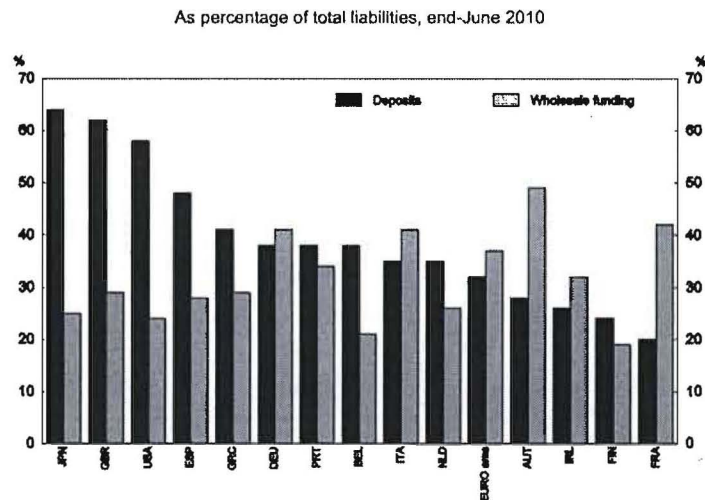


Figure 7: Bank Funding by Country
Source: OECD National Accounts

of Europe. Unfortunately, once property prices started to decline, the banks began to experience losses. After these losses occurred, Irish banks had a harder time securing wholesale funding and needed to find other sources of funding. Another reason Irish banks could not secure foreign finance was because the global economy was suffering so wholesale funding sources dried up.

Starting in 2006, banks began to raise interest rates to lower risks as well as secure more funding. However, this left borrowers unable to pay off their loans and led to a housing and banking crisis. When the housing bubble burst in 2008, the value of homes fell drastically which led to lenders and borrowers losing large sums of money. This left many homeowners with negative equity and increased interest rates as banks tried to recoup their losses. By 2010, 31% of all outstanding mortgages were in negative equity

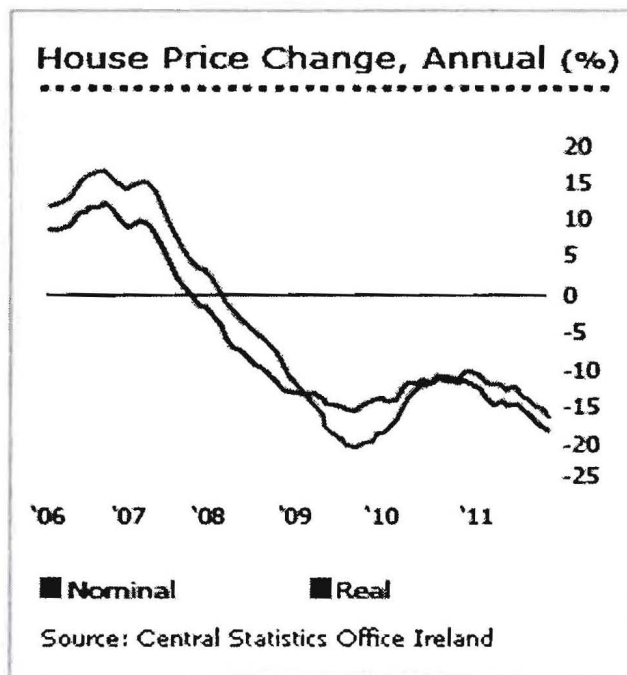


Figure 8: Housing price change
Source: Central Statistics Office Ireland

and by 2011 that number rose to 47.5% (“Irish House”). Although Ireland shows a surprisingly low level of foreclosures, it is believed that the banks do not want to be burdened with negative equity (“Irish Banking”). Roughly 9.2% of residential mortgages are in arrears of over 90 days and almost 10% of mortgages were reconstructed from October 2011 to December 2011 (“Latest Quarterly Mortgage Arrears”). These numbers are up from the previous quarter, but there was an 18% drop in repossessions. Banks seem to prefer allowing borrowers to get back on track, even if that means accepting late payments or restructuring the loan.

The Irish government assumed the crisis was a problem of liquidity, rather than solvency causing them to issue large guarantees (OECD). The government guarantees credit unions and banks slightly differently, with banks being fully backed. The Deposit Guarantee Scheme (DGS) covers up to 100,000 euros per person, per institution

("Confused by the Irish"). This scheme has no end date and applies to credit unions and banks alike. Starting December 9, 2009 the Eligible Liabilities Guarantee Scheme (ELG) was introduced. The ELG Scheme covers 7 different institutions in Ireland. This Scheme is currently in effect until June 30, 2012 but may be extended until December 31, 2012 and guarantees all amounts over 100,000 euros at the stated institutions, with the first 100,000 euros being covered by DGS ("Government Guarantee"). These guarantees are more extensive than other countries and while they prevented bank runs and widespread panic, they proved very costly for the Irish government.

With these guarantees in place, along with bank failure not being an option for the Irish government, the government has injected large sums of money into the banking sector. The taxpayer support of banks in Ireland amounts to roughly 30% of the countries GDP ("Lessons of the Irish"). Anglo, Irish Nationwide, AIB, Irish Life and Permanent, and EBS have all effectively been nationalized through government injections of money, since the banks could not secure private investment ("Irish Banking Crisis"). The total bail-out cost was estimated at 70 billion euros in March 2011, making it the most expensive bail-out in the European Union

The Irish government spends more on economic affairs, housing and health than the average OECD country and less on general public services and defense. Economic affairs contributes to the banking sector, in 2008 this was at 13.8% compared to the average of 11.4%. As the banking crisis continues to get worse, the spending on economic affairs will only increase. Another noticeable budget value is the housing costs; Ireland is at 4.7% while the average country is at 1.9%. This helps to illustrate the housing crisis in Ireland. Although spending on general public services was lower in

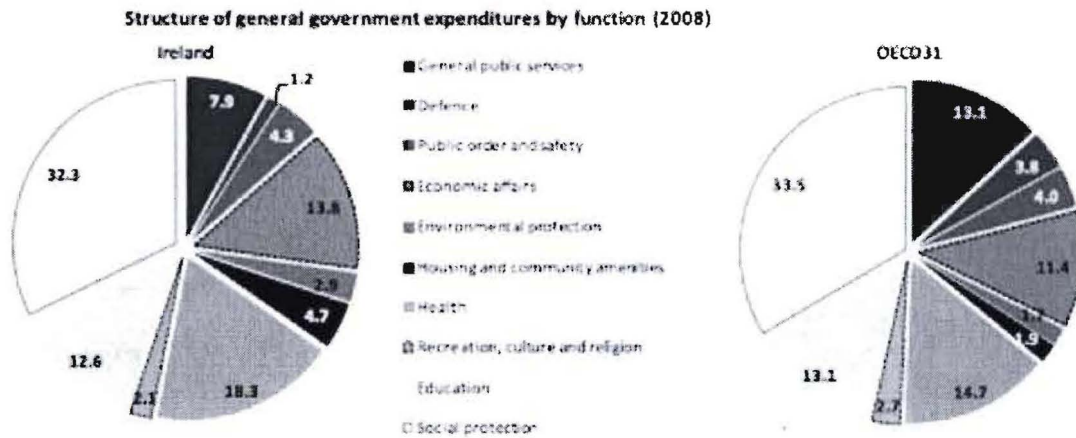


Figure 9: Structure of general government expenditure-Ireland

Source: OECD National Accounts

Ireland, this is expected to increase as interest payments on foreign debt rise (OECD). The Irish government structural fiscal balance is -7.4%, this is problematic since it is higher than average. Ireland will need to restructure their budget to bring this deficit closer to the average.

Ireland is one of the most centralized OECD countries, collecting 76.8% of revenues compared to the average of 57.7%, as well as making up 71.6% of expenditures compared to the average of 45.8%. Even local governments are financially dependent on the central government, receiving resources as grants. The Irish government also has a higher compensation of general government employees; although their production costs are lower than average. Proportionally, they spend 56.4% of total production costs on compensating government employees compared to the average of 48.1% (OECD). The government plans on implementing budget cuts soon so this percentage will decline in coming years.

Ireland has suffered from low or negative annual growth rates over the past few years as well. From 2006 to 2010 the real GDP growth rates were 5.3%, 5.6%, -3.5%, -7.6% and -1% respectively (OECD). In 2008, the banking and housing crisis officially

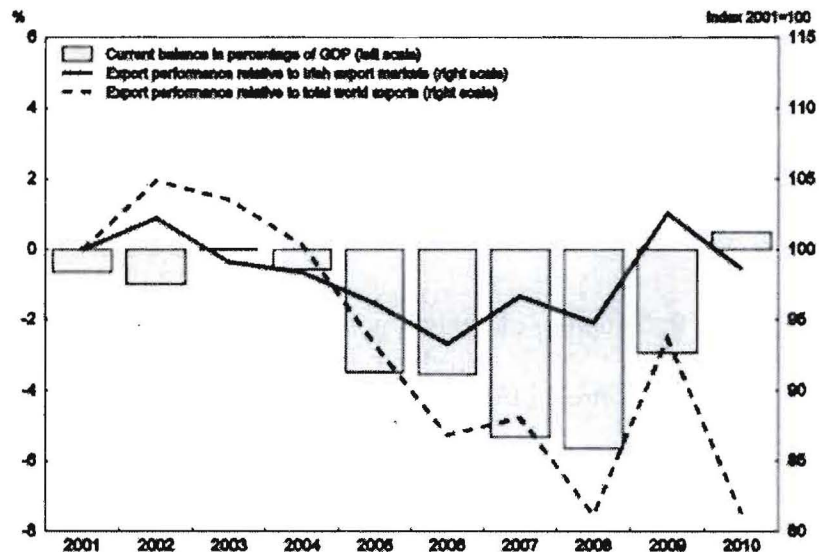


Figure 10: Current Balance – Ireland
Source: OECD National Accounts

began, which correlates with the growth rate trend. Fortunately it looks like things are starting to turn around for Ireland but they still have a long way to go. The agriculture sector is starting to pick up, while the industry sector is slowly recovering after a hit in 2008, and the service sector is still declining in growth. The increased productivity in agriculture has increased the amount of exported goods; this will help the economy in the long run. The recent recovery in exports has relied on high-technology sectors as well as the agriculture sector (OECD). Although Ireland has been struggling with exports since 2005, they finally saw an increase in 2010 again. By restoring competitiveness and increasing exports, Ireland will see lower unemployment rates as well as growth in the economy.

Ireland still has a long way to go to improving their economy. The banks are still struggling in trying to find long-term solutions. However, Ireland recognizes the need to improve their business sector and is trying to encourage businesses to open in Ireland. This will definitely help them grow and could inject money back into the banks. If Ireland can continue to increase their growth rates, they will slowly rebuild their economy. As the bank guarantees come to an end in 2012, they government may consider reducing the amount guaranteed. Once their economy begins to turn around, perhaps they need to force banks to have stronger policies to determine credibility for loans.

Spain

Like many other countries, Spain suffered a housing crisis in 2007-2008. Real estate and construction loans right before the bubble burst accounted for a staggering 17% of total loans given out by banks in Spain (Schaefer Muñoz and House). As a result, the Spanish economy faltered, and annual GDP growth for 2008 fell to 0.9%, and even further to -3.7% in 2009 (see fig. 11).

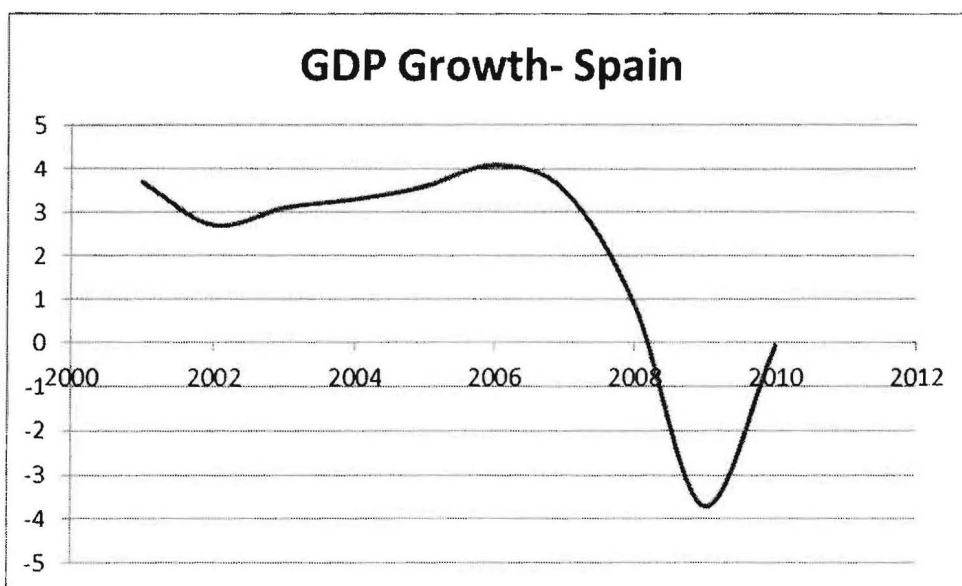


Figure 11: GDP Growth-Spain
Source: Eurostat

In spite of this, however, some optimism remained. Schaefer Muñoz and House of the *Wall Street Journal* reported that “in contrast to the U.S. banking industry, where writedowns and loan woes have resulted in a wave of dividend cuts and capital infusions, Spain’s banks have held up remarkably well,” and attributed it to the different regulatory system, which required more reserves to be set aside.

Commercial banks, however, only account for roughly half of deposits and loans in Spain. The other half of the Spanish banking system is made up of small local banks called *cajas*, from the Spanish *caja de ahorro*, which literally translates to savings box. They are run not by bankers or maybe not even people with business degrees, but by a board of local leaders: politicians, prominent families, or local business owners. One *caja*, CajaSur, is even run by the Catholic Church. *Cajas* take in deposits from the locals, and then give out small loans to those same locals. Since each *caja* operates in just one town, the members of the board usually know the recipients of their loans personally, and are in tune with the current overall state of affairs within that town, this method of operating makes sense in a way. *Cajas* have been operating this way successfully for hundreds of years, until very recently (Joffe-Walt).

Shortly after the introduction of the euro, with the real estate market seeming to be ever-increasing, the boards of the small savings banks branched out. The loans being given out started to get larger and larger, and *cajas* even started borrowing to write more loans. This new way of doing business was clearly very different from the previous practice of only using deposit money to write much smaller loans. *Cajas* suddenly found themselves dealing with huge international insurance companies and investment funds

instead of local small business owners (most of whom the board knew personally), and many boards suddenly found themselves under-qualified to be what were now becoming more and more like commercial banks. The countryside of Spain is now littered with empty housing developments, commercial buildings, and even an empty airport. It's hard to tell whether this should be blamed on the housing crisis or the fact that the boards of these *cajas* over-extended themselves (Joffe-Walt).

Spain's unemployment rate may in itself constitute its own crisis. While it has historically always been high- the highest in the EU, in fact- it rose even higher to 20.1% in 2010 (see fig. 12), and reached a staggering 23.6% in March 2012 (Eurostat).

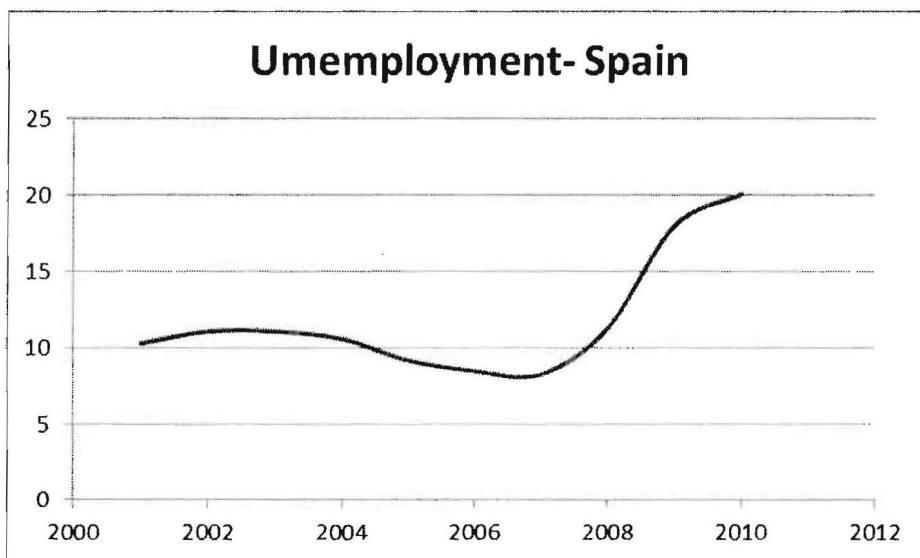


Figure 12: Unemployment- Spain
Source: Eurostat

Spain may have these historically high levels because of “rigid labor laws [that] make it easier to dismiss workers than to adjust their wages or change their duties,” (House and Román). Spain's seemingly chronic unemployment problems have only worsened with

the housing boom and bust of the last decade, which took a huge toll not only on real estate, but also the Spanish banking sector, especially the *cajas*, mentioned above. One of the results of this economic environment is an unemployment rate twice the size of the EU average (House and Román).

Even though Spain's new government is undertaking labor reforms, there is still much to be done to alleviate the situation. The Spanish government suffered from a growing discrepancy between revenue and expenditure in 2009, "due to the stimulus and automatic stabilizers" (OECD). The recession in 2008 and 2009 caused government revenue to go down, but spending to go up, since governments are expected to provide

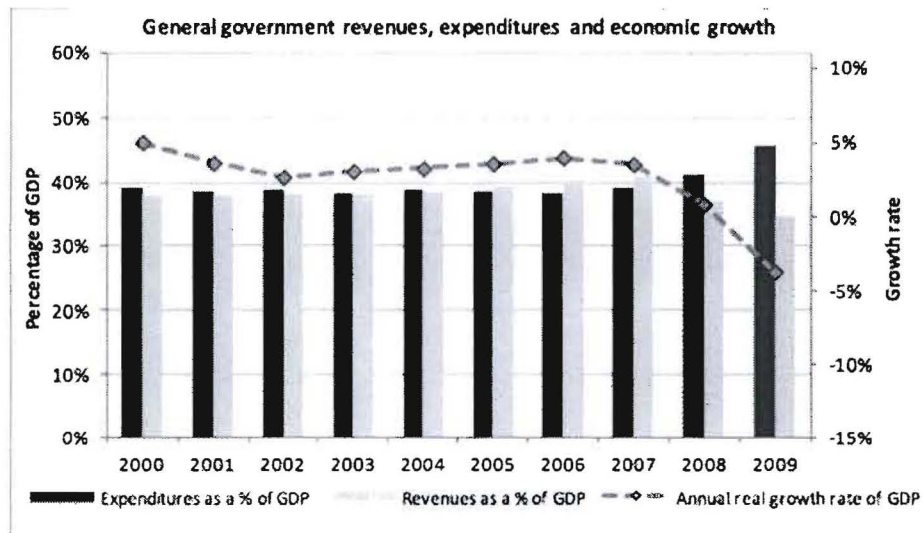


Figure 13: Revenues, expenditures, and economic growth
Source: OECD National Accounts

some form of stimulus. This can be problematic for governments since this creates a wide gap between revenue and expenditures, as seen in Figure 13. In the case of Spain, the economic situation is much more precarious, since the existing labor laws contributed to skyrocketing unemployment, and outdated *cajas* found themselves with mountains of debt they were not prepared for. There is a lot of demand for the Spanish government to

provide aid to the banks and alleviate unemployment, which has caused long term bond yields to go up, and S&P to downgrade Spain's credit rating ("Spanish Unemployment Hits Record 5.64 Million.").

Spain is the fourth largest economy in Europe, and twice the size of Greece, Ireland, and Portugal combined. Because of its size and the amount of Spanish debt held by other countries, Spain is widely considered to be country that could "bring down the global financial system." It's doubtful that the European Stabilization fund can handle a bailout of the size that would be needed if Spain was in danger of default (Joffe-Walt).

Germany

Germany is the largest, and widely considered the most stable and "safest" economy in Europe (Klein and Kliff). Germany is also the literal fiscal center of the European Union, having established most of the rules to join the euro, and is even home to the European Central Bank, or ECB (Kenney and Chase). The German economy in general is noted for its low inflation (Blumberg), trade surplus, and low unemployment ("What Germany Offers the World").

The hyperinflation of the 1920s is burned into the German national memory. Inflation rates grew so high and so fast that even almost 100 years later, Germans have an almost instinctual fear of price increases. This fear of hyperinflation may have lasted so long because the German people will forever associate rapid inflation with something citizens of other countries don't have in their past: the rise of the Nazi party (Kenney and Chase). The result of this national aversion to inflation has been historically very stable prices. In fact, inflation hasn't risen above 2% in Germany since 1995 (see fig. 14).

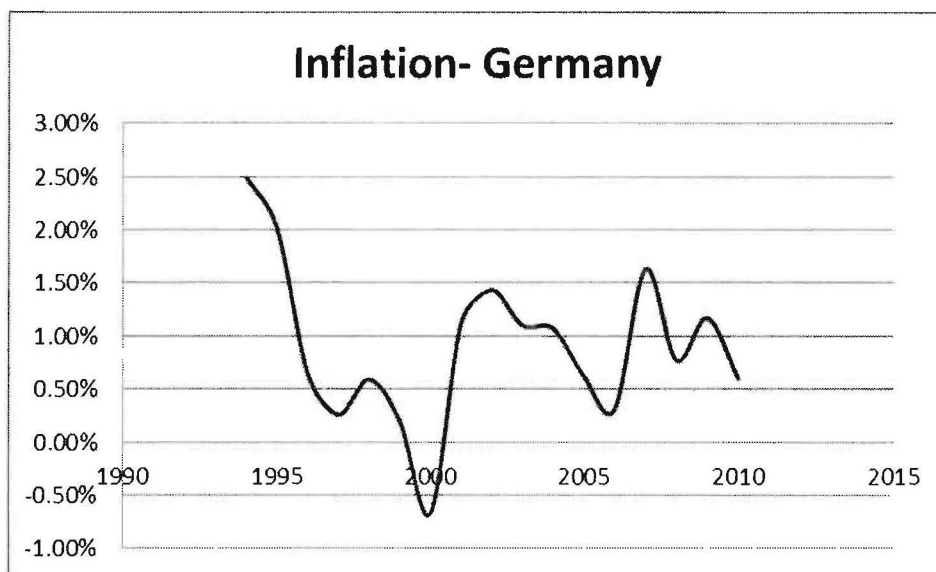


Figure 14: Inflation- Germany
Source: World Bank

Such low inflation can be beneficial to an economy to several reasons. A relatively low and stable inflation rate is widely considered to be a prerequisite for sustained economic growth, since if inflation is low and predictable its role in the decision making process is minimalized. High inflation rates decrease the real return on money and make price signals unclear to the consumer (Anderson).

Germany also has a thriving manufacturing sector, which leads to a substantial trade surplus. In fact, Germany has the highest trade surplus in the euro area (Eurostat), which means it can avoid systemically consuming on credit, which may have contributed to the problems in countries like Greece. Not only does Germany have a substantial trade surplus, but its manufacturing sector is also growing, and made a substantial comeback from the worst of the recession in 2009 (see fig. 15).

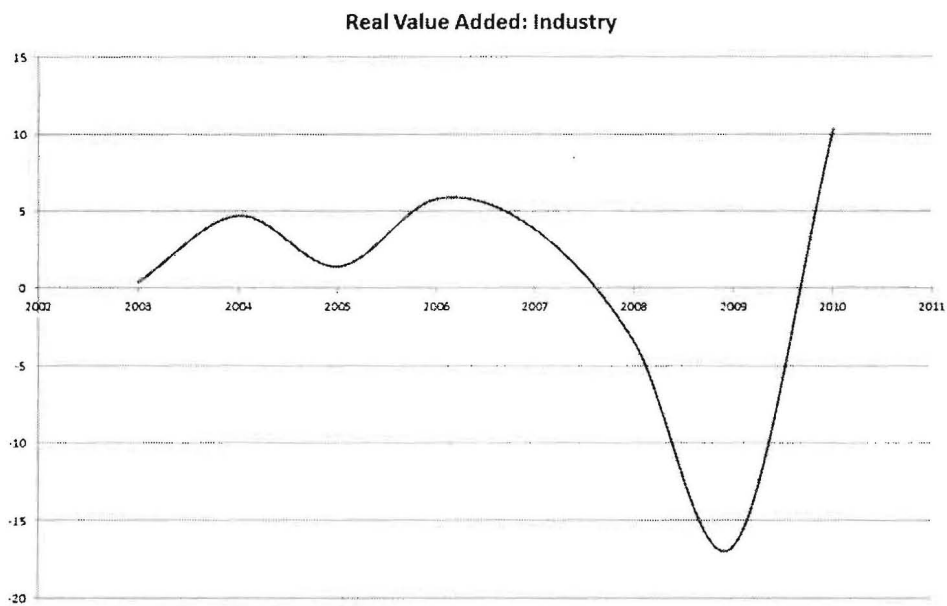


Figure 15: Real value added:
industry
Source: OECD

Since the trade surplus means Germany doesn't have to rely consuming on credit, the German government has a lower than average budget deficit of 3.3%. While it is more of a deficit than in recent years, comparatively speaking, Germany's deficit is on the low end (see fig. 16)

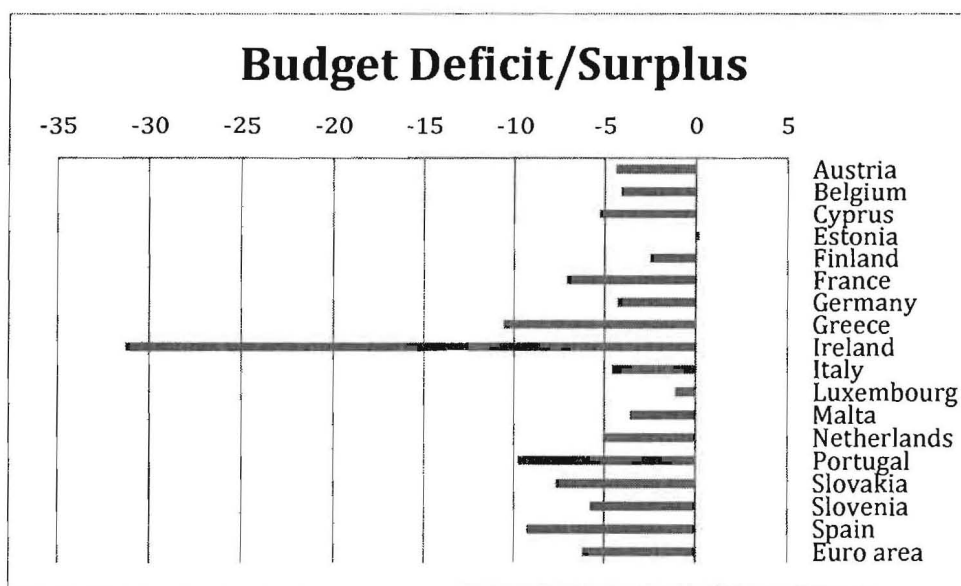


Figure 16: Budget Deficit by
Country
Source: Eurostat

The Netherlands

The Netherlands is considered one of the most stable economies in northern Europe along with Germany and Great Britain. The Dutch economy is the 5th largest economy in the euro zone behind Germany, France, Italy and Spain when comparing GDP. While being a large economy and major country in the Euro zone it is also noted for its moderate unemployment, moderate inflation, trade surplus, and relatively low budget deficit (Netherlands). These factors contribute to the Netherlands relatively stable economy.

The Netherlands has an open economy, which makes them more susceptible to downturns in the global economy. Despite this, they did not suffer any more than other euro zone country during the downturn in 2008 and 2009 (“Economic Development”). The Netherlands has consistently boasted a high export rate earning about 33% of its income from exports of goods and services. Their high export rate is one reason they continue to have a stable economy. The major exports are machinery and equipment, chemicals, fuels, electronics, and foodstuffs. The Dutch government is currently consolidating their budget to recover from the global economic downturn but it will be difficult for them to fully recover until exports pick up.

The Netherlands is also known for its unique fiscal policy. Their framework is based on longer-term budgetary sustainability considerations and analyzing short-term, medium-term and long-term developments in public finances. They have advisory offices, such as the Central Planning Bureau, Statistics Netherlands and the Netherlands

Court of Audit, checking these variables annually to adjust their policy as needed (Bos).

The monitoring was crucial when they saw their budget deficit rise to 5.3% in 2010 compared to 0.7% of GDP in 2008. They began implementing their consolidation method

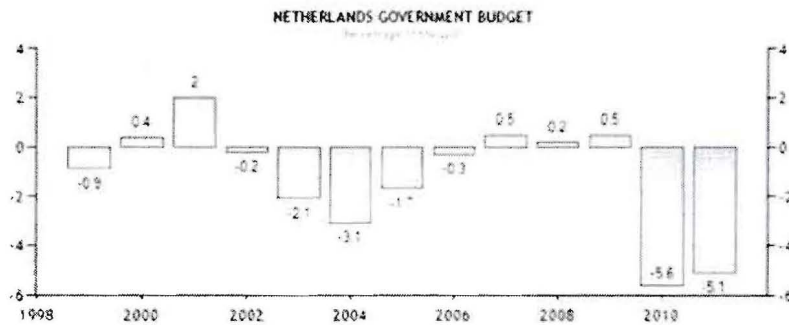


Figure 17: Netherlands Budget Deficit
Source: CIA World Factbook

in 2011 and improved their deficit to 4.2% (Netherlands). By monitoring their statistics and adjusting their budget accordingly, The Netherlands has seemed to avoid any major trouble in their economy, with only slight setbacks over the years.

The Netherlands is also one of the few countries to set medium-term expenditure ceilings. Medium-term expenditure framework links macro-economic policy with fiscal policy by using macro-analysis to help set a balanced budget (Houerou). Using this integrated approach, expenditures is estimated three years out from the present and a spending plan and budget is determined (Deardorff). Medium-term expenditure framework focuses on having appropriate policies in place rather than short-term cash management ("What Is A Medium-Term"). This provides more predictable program funding, more predictable fiscal behavior, and efficiency in managing public finance (Bos). The OECD stresses the importance of national fiscal rules and highly recommends the Dutch system.

The current Dutch government is implementing a fiscal consolidation strategy with a goal of fiscal balance by 2015 (OECD). The consolidation plan is incorporated

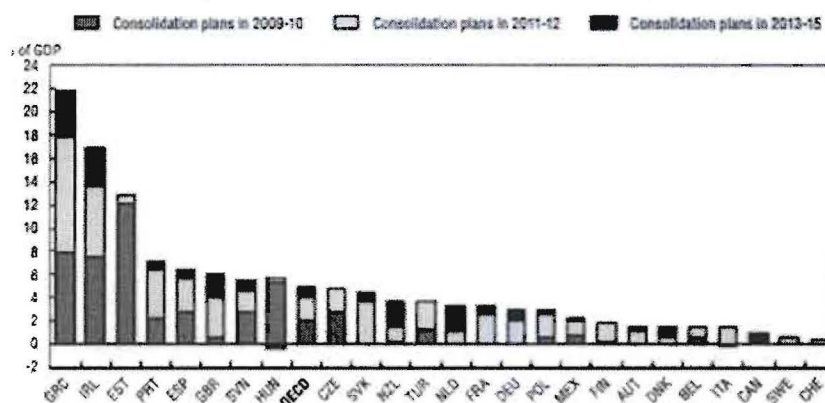


Figure 18: Consolidation Plans by Country
Source: OECD

into the medium-term expenditure framework. By reviewing their statistics, they were able to come up with a strategy that would fit it with their overall goals. These goals include not reducing spending in the fields of security and health care. By monitoring their budget three years out, it allows the Netherlands to make changes quicker and keeps the negative impact to a minimum. Instead of prolonging a plan until the public finances deteriorated to the point of needing a front-loaded consolidation package, the Dutch government announced their medium-term fiscal consolidation strategy as a pre-emptive step. This is one reason why their consolidation plan is significantly less than other countries in the euro zone (Jan De Geus).

Netherlands budget is very comparable to the OECD average. They spend slightly more on general public services and social protection, and slightly less on

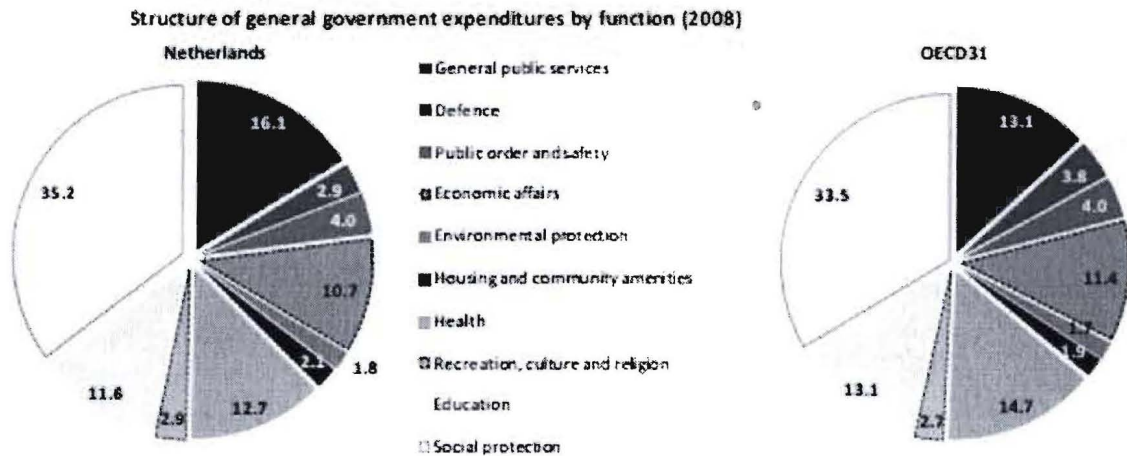


Figure 19: Structure of general government expenditure- Netherlands

defense, economic affairs, health, and education. Overall these differences are very slight which makes the Netherlands a good country to consider an average, and to compare other countries with.

One reason the budget for healthcare is lower is because the Netherlands does not have government funded universal medical care coverage. Instead, the insurance market is patient-focused and competitive, allowing the government to monitor the quality without managing the funds (Daley). While the government set guidelines for what the minimum health insurance deal must consist of, they do not have the burden of funding it. Instead the government helps to compensate low-income earners to ensure everyone maintains a healthcare plan, this helps to keep the cost of healthcare down. This system has worked out well for the Netherlands since being implemented in 2006.

Although the Netherlands spends slightly on education, the quality of their education is actually fairly high. In the most recent PISA test, the mean performance of

Dutch students was above the OECD average. It has been shown that education is a key investment in recovering

the economy and moving	Indicators	Netherlands	OECD Average
towards long-term growth (OECD).	Low Performance (reading)	14.3% performed below level 2	18.8% performed below level 2
The Netherlands	Dropout rate	18%	19%

has made it a priority to improve the quality of their education. This

Figure 20: Education Performance Levels
Source: OECD

allows the country to keep costs down while still delivering a great education to their citizens. This is a contributing factor to the consistently low unemployment rates.

The Netherlands also has a great infrastructure that typically allows fast connections despite your method of transportation. Although congestion is starting to become a problem in some areas, since the infrastructure is already in place it is simply a matter of expanding it (Kozluk). The rush hour commute is placing heavy stress on motorways and citizen’s commutes are now longer than any other

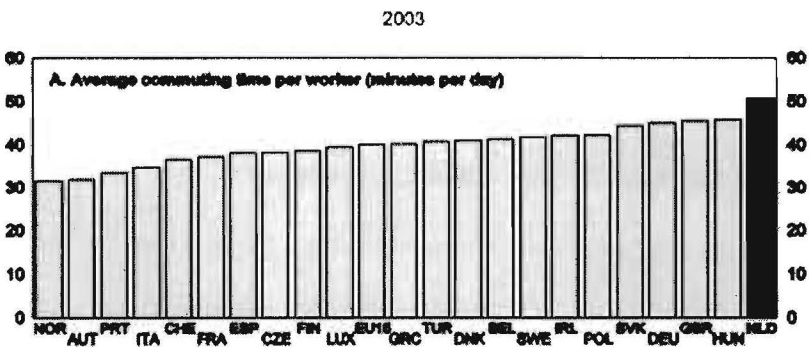


Figure 21: Average Commute
Source: OECD

European country. However, simply by redirecting some traffic to local roads, and widening motorways could help reduce this congestion. The Netherlands has the third highest quality of air transportation and the best basic infrastructure in Europe. This encourages business development and makes it easy for them to move goods around which allows the Netherlands to export goods easily (“Transport and Technology”).

Although the Netherlands had some setbacks during the Global Recession, they are still considered a stable economy. This is due in part to their budgeting strategy as well as their focus on growth. By investing in a great infrastructure system, they allowed themselves to be competitive globally and their economy has remained strong. In 2012, there was debate over the budget, and what targets to aim for. Some wanted to set a target of 3% for the budget deficit. While there was a disagreement over the terms that led to the collapse of the current government, the Netherlands eventually reached an agreement. Moving forward, their economy will continue to be one of the best in the euro zone if they can keep their strong fiscal framework in place.

Chapter 2: An analysis of variables

Aging Population/Pension Expenditure

Populations in the European Union are steadily getting older, which could be the result of an aging baby-boomer generation, or just prolonged near-zero population growth- maybe both (see fig. 22).

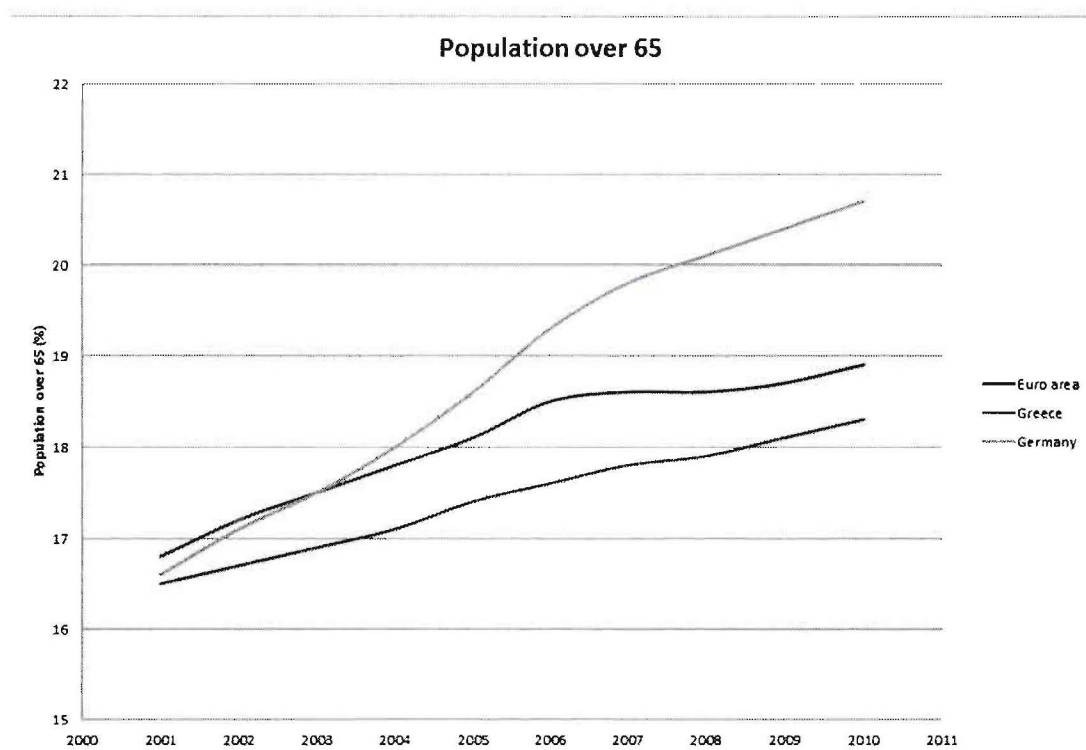


Figure 22: Population over 65 by Country
Source: Eurostat

It does not take a stretch of the imagination to figure out what problems an older population can present to a government. More people over 65 means a shrinking labor force and tax base, but governments will still be expected to pay for social programs such as pensions and health benefits, which will then cover more people (*Group of Ten - The Macroeconomic and Financial Implications of Ageing Populations*). To see if this had any measurable effect on a country's debt, a simple linear regression was used.

For each country in the euro area, the proportion of the population over 65 was used as a predictor for gross debt as a percent of GDP, the correlational coefficient was calculated, and a t-test was run on the significance of the population over 65. Anything with a p-value under .05 was considered significant (see fig. 23).

	p-value of Pop. Over 65	Correlation	Significant?
Austria	0.43998	0.27612	no
Belgium	0.01330	-0.74560	yes
Cyprus	0.16498	-0.47535	no
Estonia	0.87673	0.05653	no
Finland	0.74550	-0.11797	no
France	0.00070	0.88335	yes
Germany	0.00547	0.79986	yes
Greece	0.03909	0.65681	yes
Ireland	0.17891	0.46196	no
Italy	0.17320	0.46737	no
Luxembourg	0.98478	0.00696	no
Malta	0.36444	0.32186	no
Montenegro			n/a
Netherlands	0.03560	0.66577	yes
Portugal	0.00000	0.97205	yes
Slovakia	0.14678	-0.49393	no
Slovenia	0.31013	0.35775	no
Spain	0.24697	0.40396	no
Euro area	0.03696	0.66222	yes

Figure 23: Significance of
Population over 65 by country

Six countries and the euro area as a whole had statistically significant relationships between the percentage of the population over 65 and gross debt. What is intriguing about these results is that both some of the most stable economies (Belgium, France, Germany, and the Netherlands) and the ones in the most trouble (Greece and Portugal) have the significant relationships.

Social Security Fund Debt

Social Security fund debt was another variable analyzed since one country, France, stood out in particular. The average social security fund revenue for a country is

around 20.3% however France is at 49.3% as of 2009. The average social security fund expenditure is 22.7% while France is at 45.3%. French social security expenditure and revenue is more than double the average. This is due in part to their extensive social security plan. Under French social security, a citizen is entitled to health, sickness, maternity, family allowance, unemployment benefits, work injury and invalidity, death benefits and old age (Hampshire). The full old-age pension is available at age 60 with the minimum number of quarters of coverage worked. This pensionable age is lower than the average of 62.4. Many countries in the Euro zone are already at 65 or plan to move to 65 by the year 2035 (Turner).

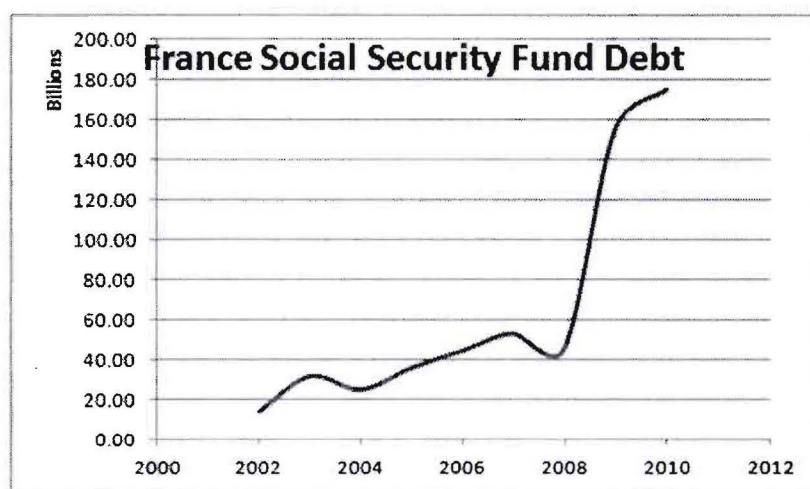


Figure 24: Social Security Fund Debt – France
Source: Eurostat

By not adjusting the pensionable age, France is increasing the amount payable due to an aging population. Between 2008 and 2010 there was a huge increase in French social security fund debt. Over the course of two years, the debt more than tripled in value. One reason the debt is rising so quickly is due to the aging population. The correlation between aging population and gross debt was significant for France as well as

the correlation between aging population and social security fund debt. This correlation is also significant for Germany, Italy, the Netherlands, Portugal and Spain. While it does not seem to be as much of a problem for these other countries since their social security fund debt is a smaller portion of expenditures, it is valuable to note that this relationship exists. France does not plan on increasing the pensionable age in the year 2035. However, if they were to increase the age, it would decrease the amount of people receiving old-age benefits. Since there is a correlation between an aging population and social security fund debt, a country with a high social security fund debt and a large aging population could reduce their expenditures by increasing the age at which people receive benefits.

Trade Balance

Another variable analyzed was Trade Balance. Although there seems to be a correlation between countries prospering during this economic downturn and a positive trade balance, this was not matched when regressions were run on data. While there was not significant correlation between GDP growth and trade balance, or budget deficit and trade balance, there was a correlation between trade balance and gross debt in quite a few countries. This shows that trade balance can potentially predict the gross debt for a country. By increasing the trade balance to have a surplus instead of a deficit, the gross debt within a country will minimize.

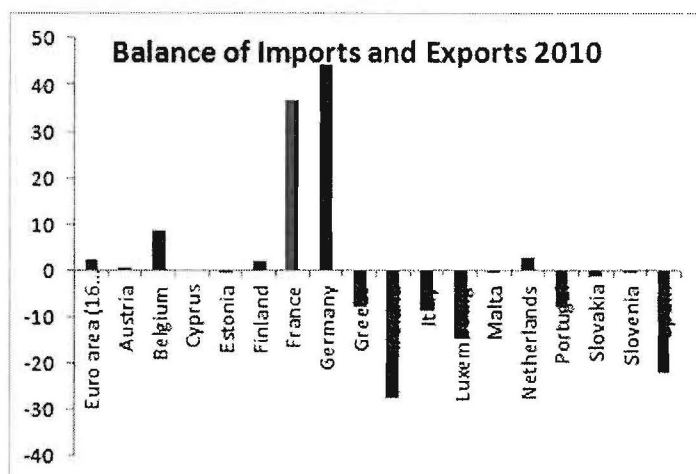


Figure 25: Trade Balance by Country
Source: Eurostat

The countries that have been facing the most severe problems during this economic downturn such as Greece, Spain, and Ireland have a very large negative trade balance. Typically if countries with a negative trade balance would focus on expanding their export market, they would grow as a country. By having more imports than exports, countries are relying on consumption instead of investing for the future. Once a country begins to rely on importing the majority of goods it can be very difficult for them to move away from this. However, countries should aim to eliminate a trade balance deficit to see a long-term improvement in their economy.

Government Revenue and Expenditure

A clear line can be drawn between how much a government receives and spends, and its debt. The less revenue a government receives, or the more it spends, the more debt it logically will have to write. To test this relationship, linear regression was again used, by country. Revenue, expenditure, and budget deficit (all as a percent of GDP) were all used to predict gross debt (see fig. 26-28)

	p-value of Deficit/Surplus	Correlation	Significant?
Austria	0.04024	-0.68863	yes
Belgium	0.85699	0.06566	no
Cyprus	0.14534	-0.49546	no
Estonia	0.20498	-0.43845	no
Finland	0.03410	-0.66980	yes
France	0.00022	-0.91309	yes
Germany	0.57921	-0.20020	no
Greece	0.01044	-0.76186	yes
Ireland	0.00000	-0.98731	yes
Italy	0.02246	-0.70616	yes
Luxembourg	0.29970	-0.36500	no
Malta	0.77251	0.10515	no
Montenegro			n/a
Netherlands	0.02422	-0.69996	yes
Portugal	0.00321	-0.82630	yes
Slovakia	0.10567	-0.54188	no
Slovenia	0.00110	-0.86882	yes
Spain	0.05905	-0.61386	no
Euro area	0.00011	-0.92825	yes

Figure 26: Significance of
Budget Deficit by country

	p-value of Gov. Revenue	Correlation	Significant?
Austria	0.38588	0.30845	no
Belgium	0.08022	0.57781	no
Cyprus	0.15214	-0.48832	no
Estonia	0.00373	0.81926	yes
Finland	0.05752	-0.61678	no
France	0.29780	-0.36634	no
Germany	0.65422	-0.16228	no
Greece	0.76997	-0.10635	no
Ireland	0.91175	-0.04041	no
Italy	0.12410	0.51917	no
Luxembourg	0.59929	-0.18988	no
Malta	0.13262	0.50938	no
Montenegro			n/a
Netherlands	0.18449	0.45676	no
Portugal	0.11037	0.53586	no

Slovakia	0.00818	0.77705	yes
Slovenia	0.03216	0.67521	yes
Spain	0.02515	-0.69680	yes
Euro area	0.20511	-0.43833	no

Figure 27: Significance of Gov.
Revenue

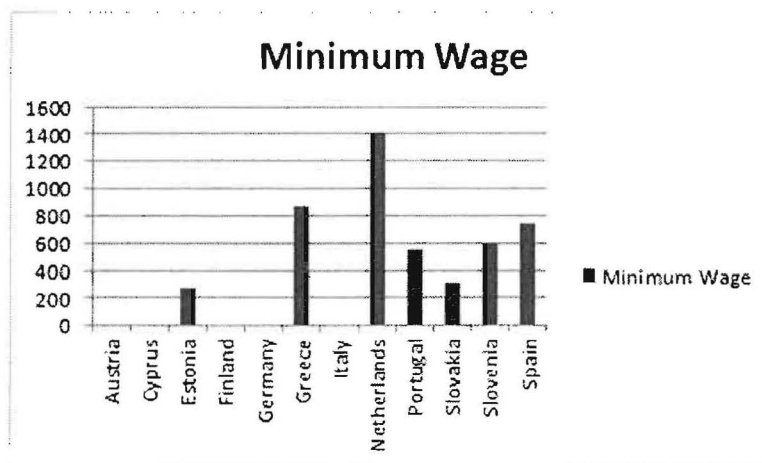
	p-value of Gov.		
	Expenditure	Correlation	Significant?
Austria	0.01848	0.72159	yes
Belgium	0.01035	0.76239	yes
Cyprus	0.59276	0.19322	no
Estonia	0.44478	-0.27334	no
Finland	0.88087	0.05462	no
France	0.09434	-0.55710	no
Germany	0.00897	0.77141	yes
Greece	0.00059	0.88837	yes
Ireland	0.05325	0.62518	no
Italy	0.13560	0.50605	no
Luxembourg	0.00001	0.95764	yes
Malta	0.69932	0.14018	no
Montenegro	0.69689	0.14136	no
Netherlands	0.05194	0.62786	no
Portugal	0.00507	0.80387	yes
Slovakia	0.00000	0.97649	yes
Slovenia	0.00000	0.96947	yes
Spain	0.00471	0.80769	yes
euro area	0.00102	0.87132	yes

Figure 28: Significance of Gov.
Expenditure by country

Government revenue displayed little to no relationship to gross debt, but both budget deficit and expenditure as a percent of GDP had statistically significant relationships with gross debt in about half of the countries in the euro area. Studies of both variables found that, in general, as deficit or expenditure increased, so did gross debt. This indicated that large deficits or overspending may be a cause of this debt crisis.

Productivity

Another relationship that was analyzed was that between labor productivity and minimum wage. Initially it appeared as though there may be a relationship between high labor productivity for a country and a low minimum wage. For example, Germany, Austria, and Finland all display this trait while countries like Greece and Estonia show the opposite. However once Slovakia, Slovenia and Spain are analyzed as well it is clear to see that although they have decently high minimum wages, they also have some of the highest productivity outputs. This seems to show that it was a coincidence rather than an actual correlation. Further proof was obtained when regression tests were ran and the variables were not significant in any country.



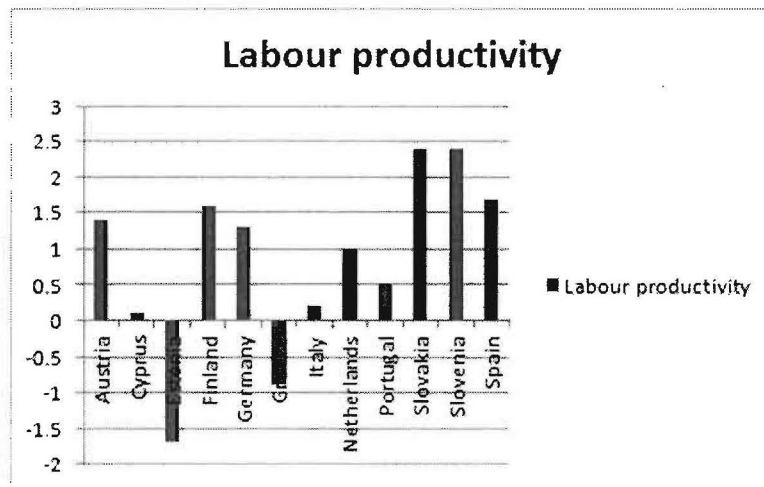


Figure 26 (Top Chart): Minimum Wage by Country
 Figure 27 (Lower Chart): Labor Productivity by Country
 Source: Eurostat

Conclusion:

There is not one variable that caused the euro crisis. Instead, each country has a unique situation that led to their current economic position. Greece has been consuming on credit for years, Ireland's housing crisis led to a massive banking crisis, Spain forced its small banks to take on too much, while the Netherlands did well by maintaining a strong fiscal policy and planning ahead and Germany continued to export goods to maintain its strong economic position. While certain countries shared common variables, such as trade balance indicating economic position, no variable applied to every country. Moving forward there is not one solution to improve the entire euro zone. While the European Central Bank is loaning to countries in need, this is a short-term solution. Once

the countries begin to turn their economy around they need to implement long-term solutions to prevent a crisis from happening again.

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